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Jiang

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(54) **METHOD AND APPARATUS FOR ATTACHING MICROELECTRONIC SUBSTRATES AND SUPPORT MEMBERS**

(75) Inventor: **Tongbi Jiang**, Boise, ID (US)

(73) Assignee: **Micron Technology, Inc.**, Boise, ID (US)

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(51) **Int. Cl.**

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H01L 23/48	(2006.01)
H01L 29/40	(2006.01)
H01L 27/146	(2006.01)
H01L 27/148	(2006.01)

(52) **U.S. Cl.** **257/783**; 257/782; 257/777; 257/784; 257/E27.137; 257/E27.144; 257/E27.161

(58) **Field of Classification Search** 257/782–784, 257/777, E27.137, E27.144, E27.161
See application file for complete search history.

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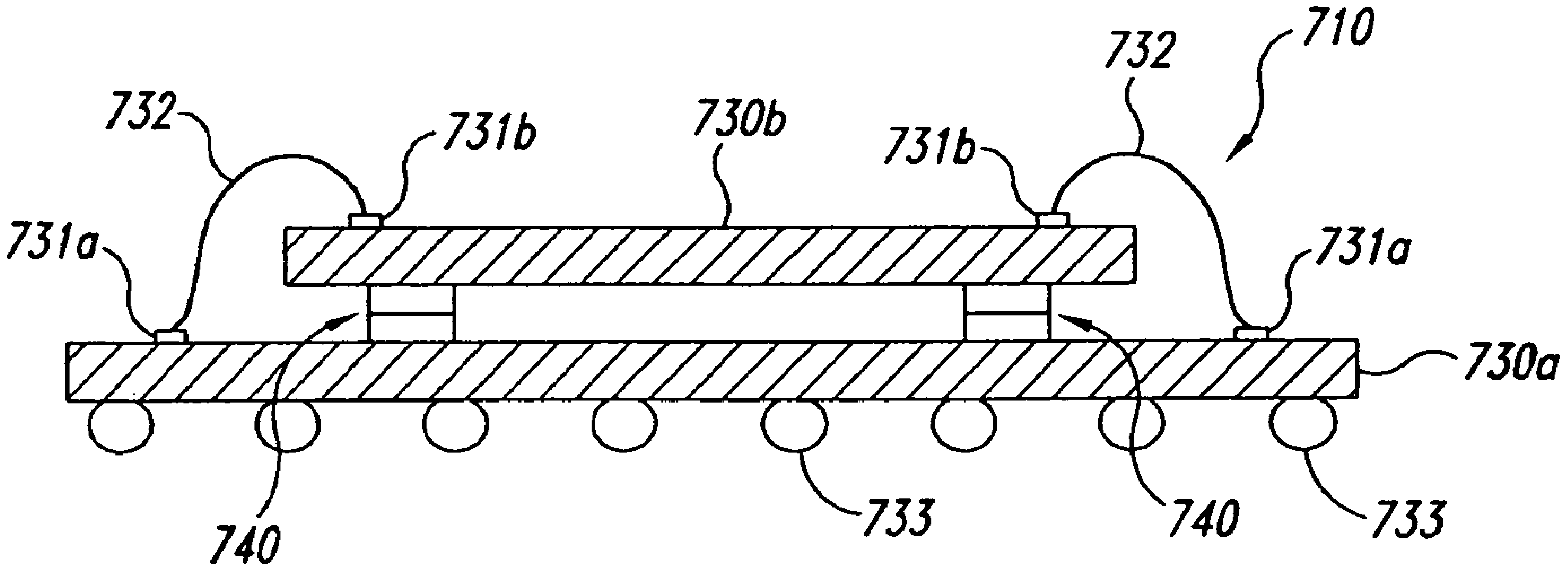
Primary Examiner—Luan C Thai
(74) *Attorney, Agent, or Firm*—Perkins Coie LLP

(57) **ABSTRACT**

A microelectronic package and method for forming such packages. In one embodiment, the package can be formed by providing a support member having a first surface, a second surface facing opposite the first surface, and a projection extending away from the first surface. A quantity of adhesive material can be applied to the projection to form an attachment structure, and the adhesive material can be connected to a microelectronic substrate with the attachment structure providing no electrically conductive link between the microelectronic substrate and the support member. The microelectronic substrate and the support member can then be electrically coupled, for example, with a wire bond. In one embodiment, the projection can be formed by disposing a first material on a support member while the first material is at least partially flowable, reducing the flowability of the first material, and disposing a second material (such as the adhesive) on the first material.

13 Claims, 5 Drawing Sheets



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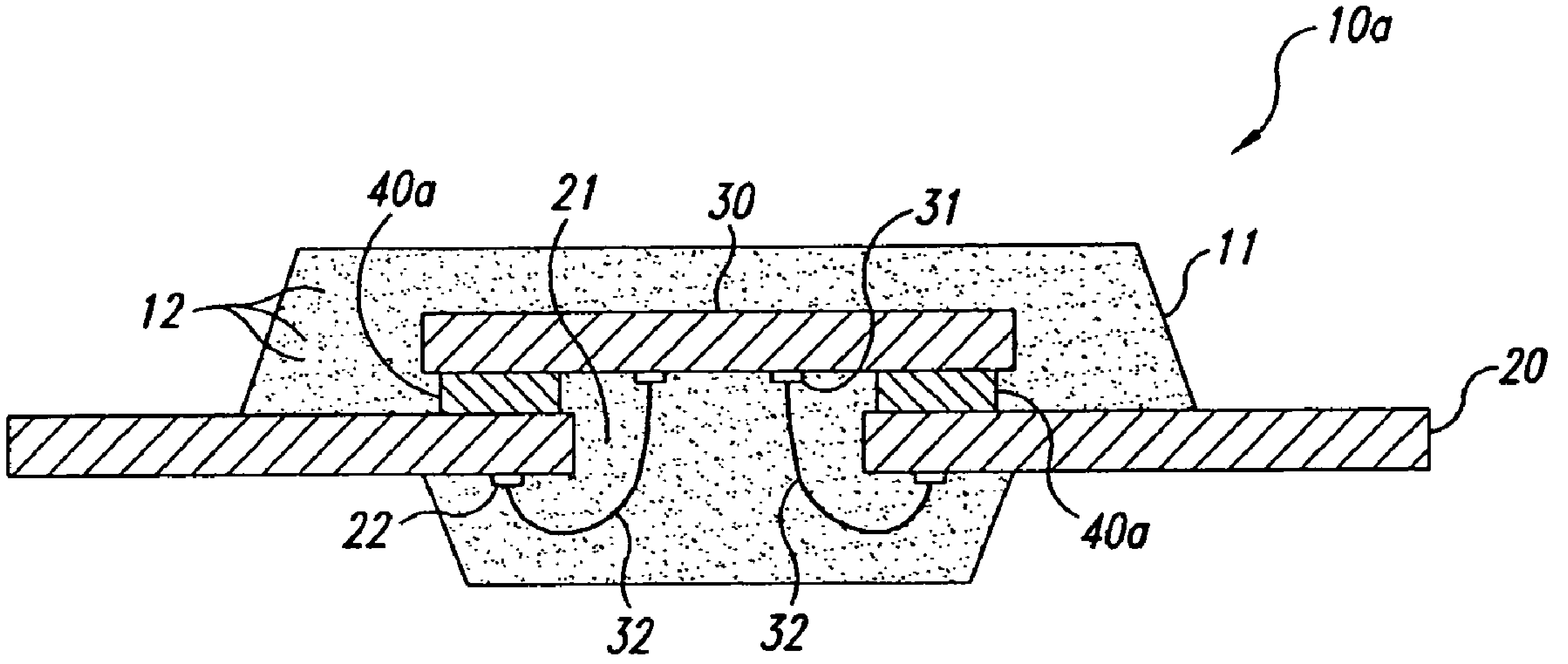


Fig. 1A
(Prior Art)

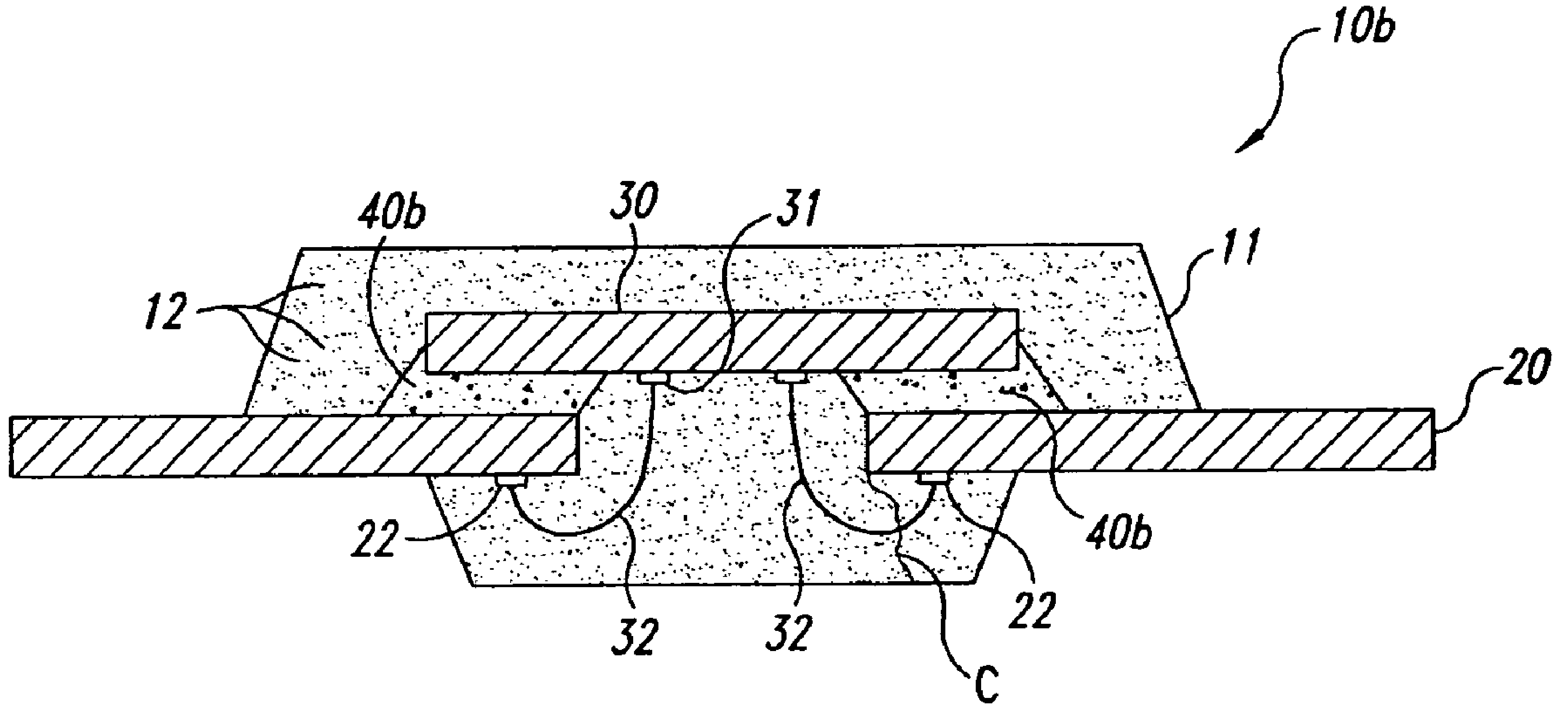


Fig. 1B
(Prior Art)

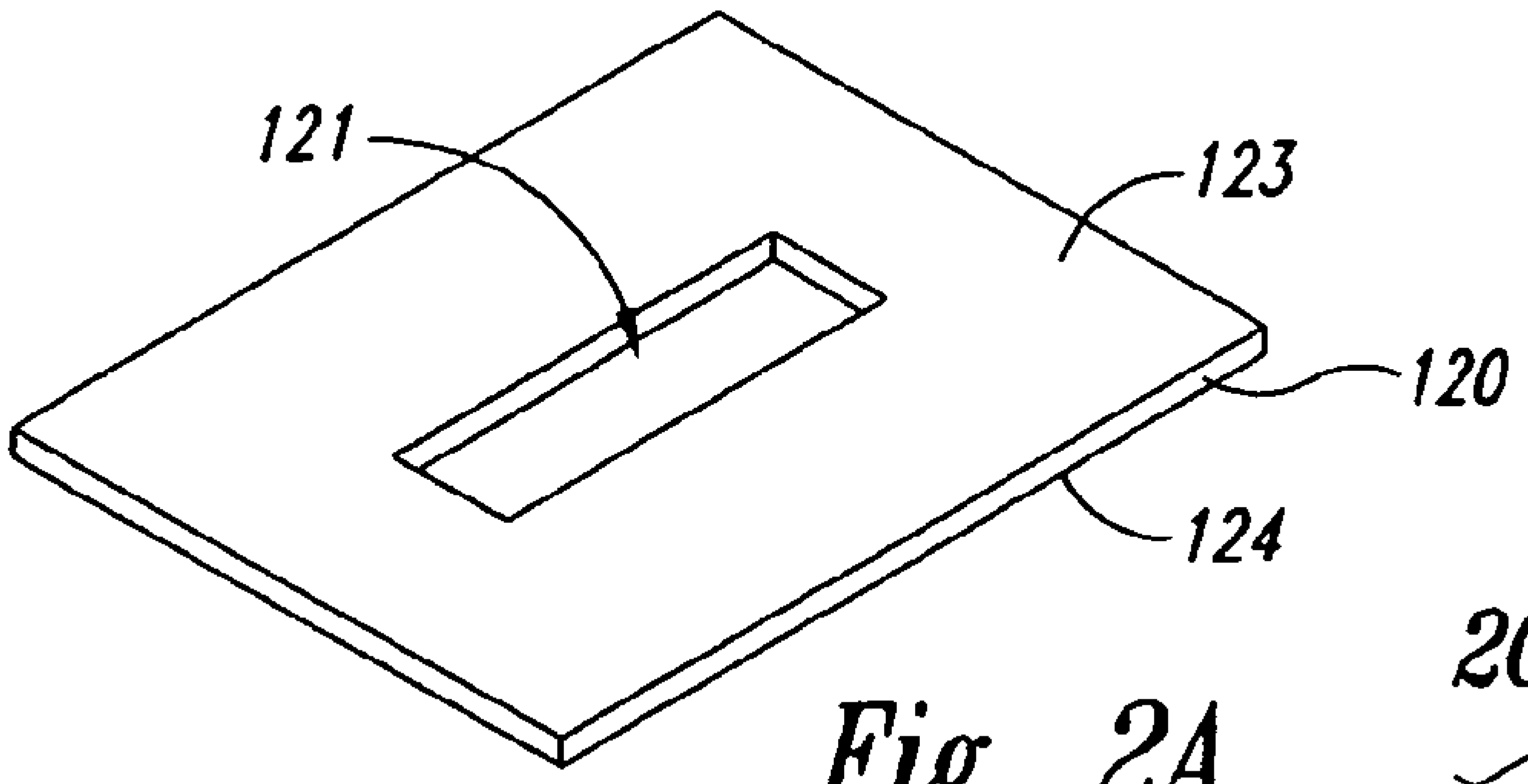


Fig. 2A

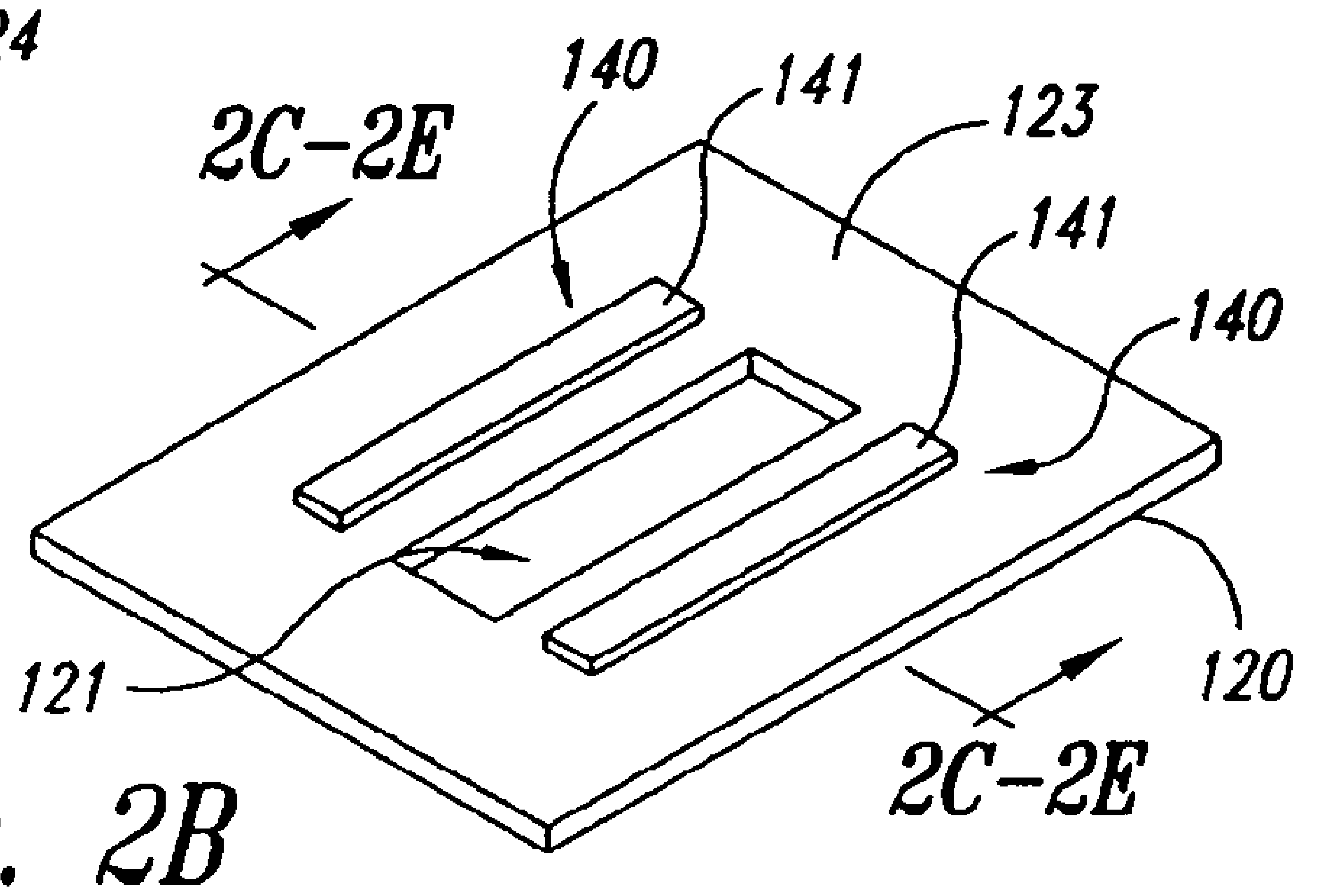


Fig. 2B

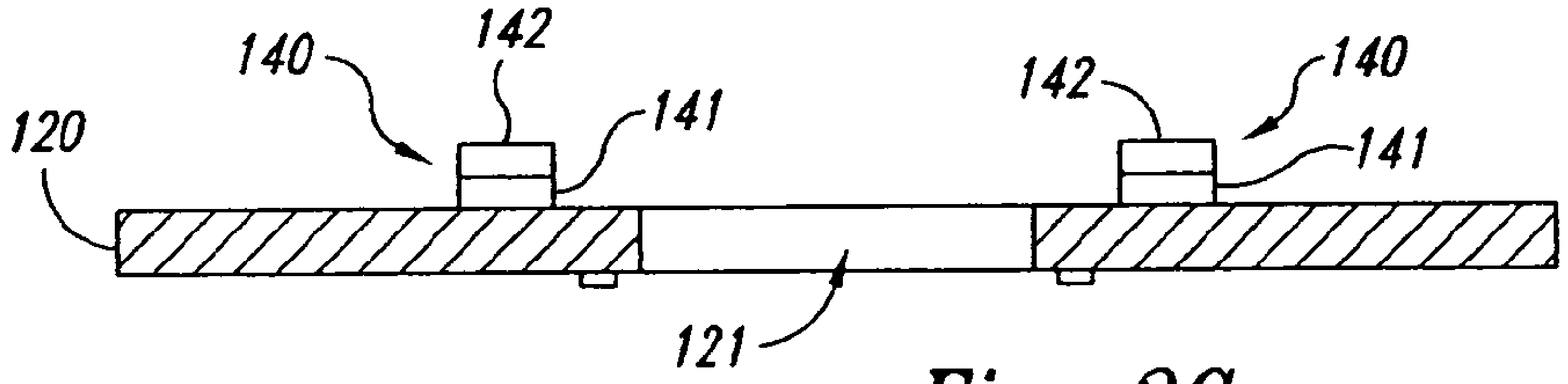


Fig. 2C

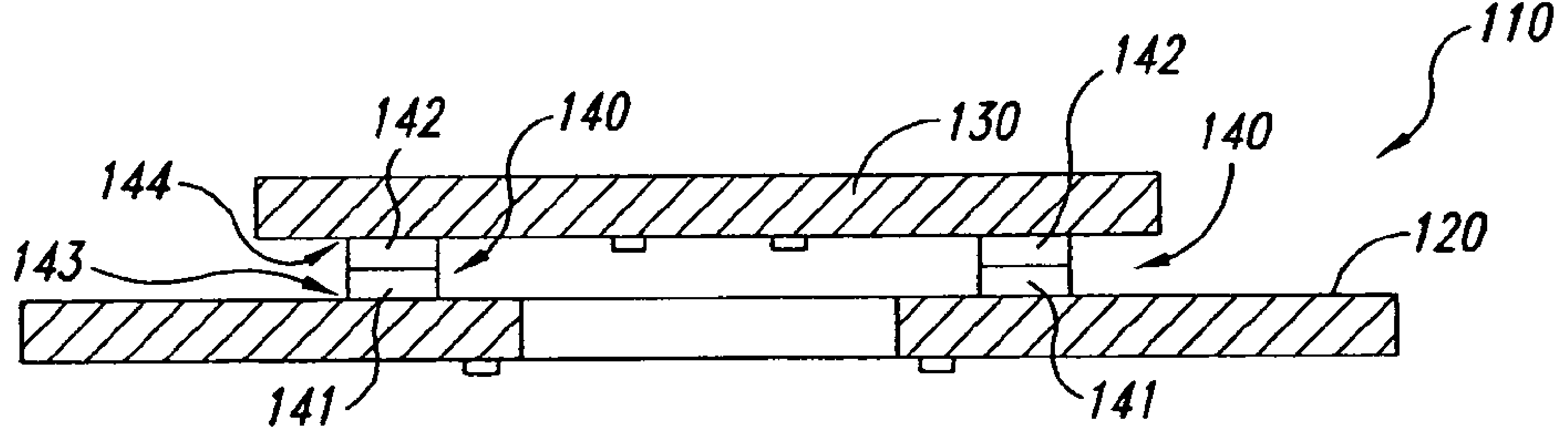


Fig. 2D

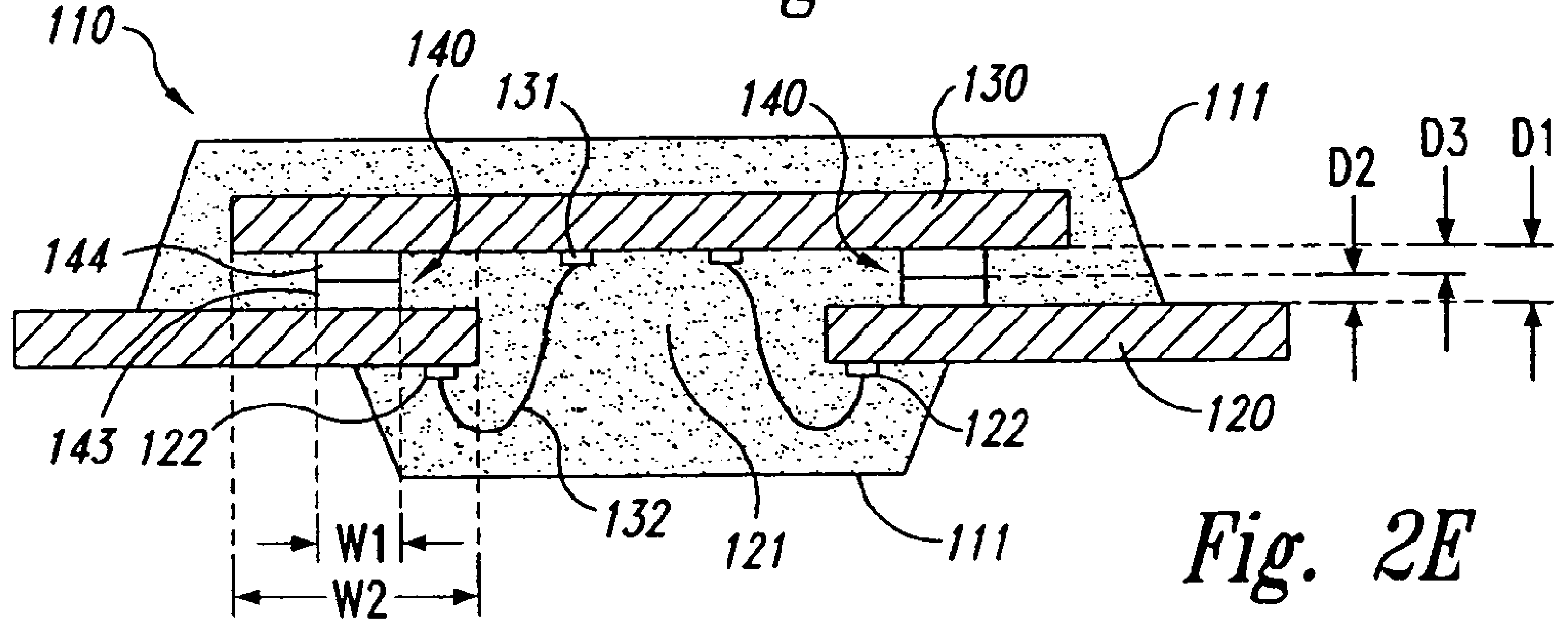


Fig. 2E

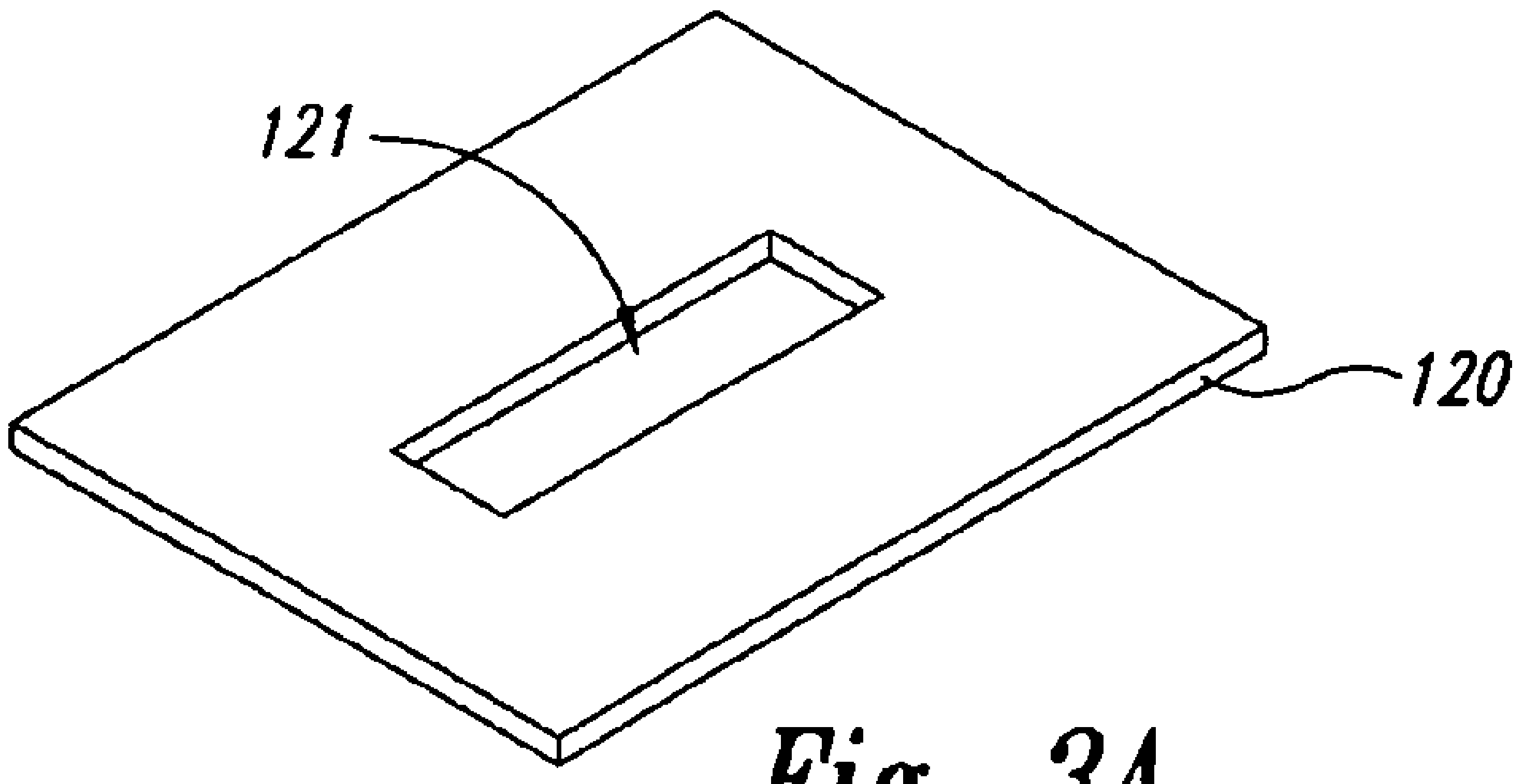


Fig. 3A

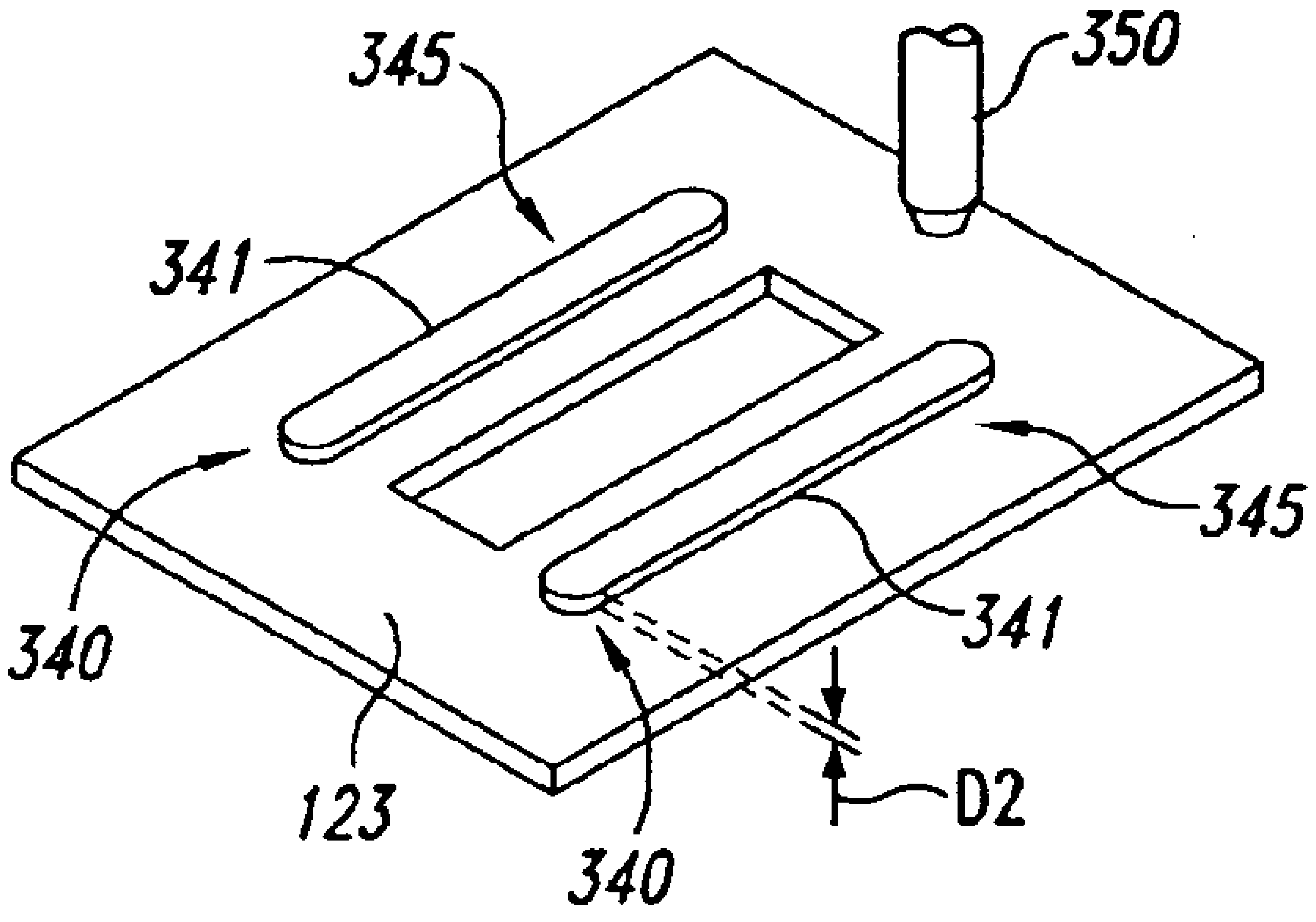
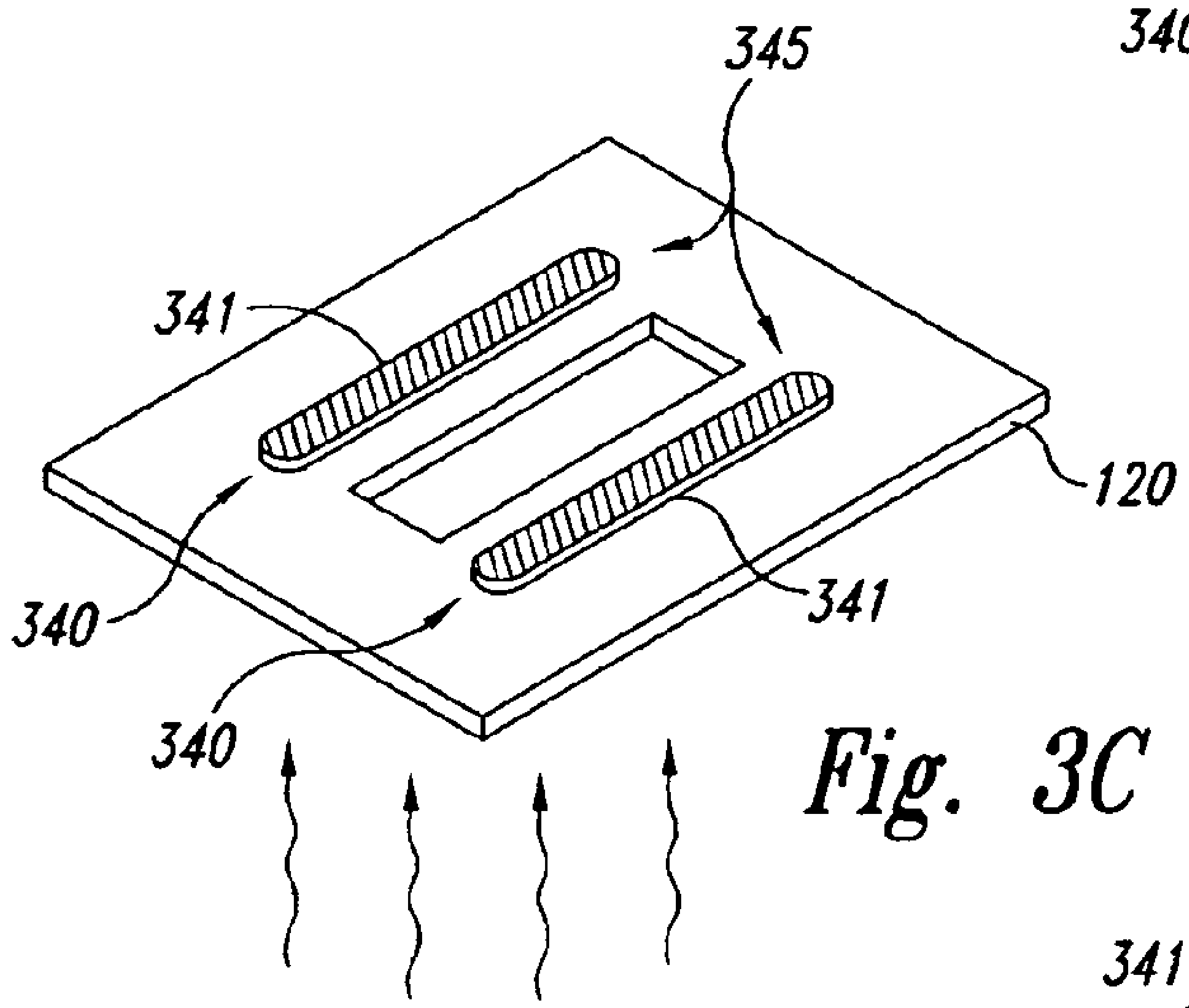


Fig. 3B



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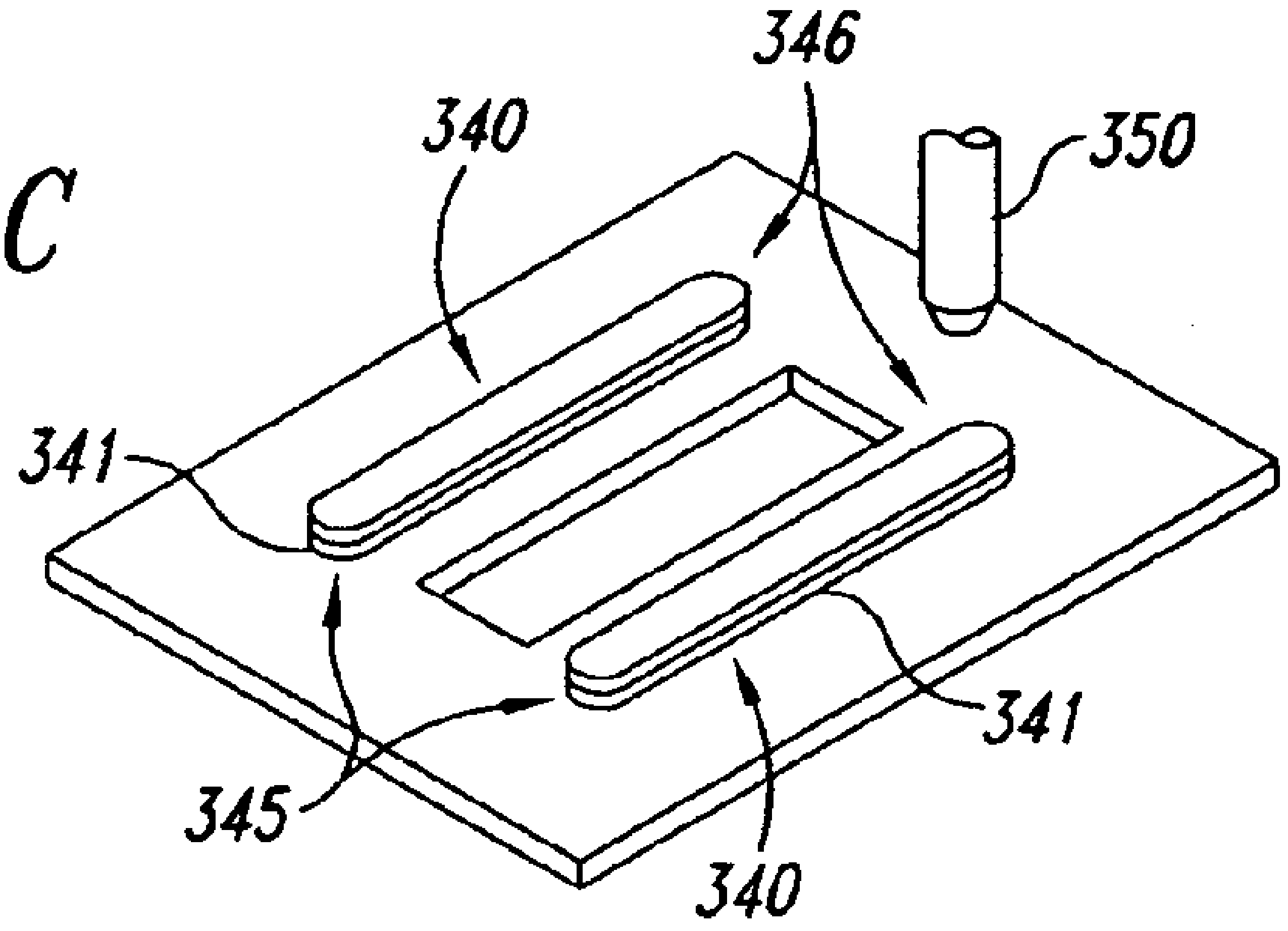

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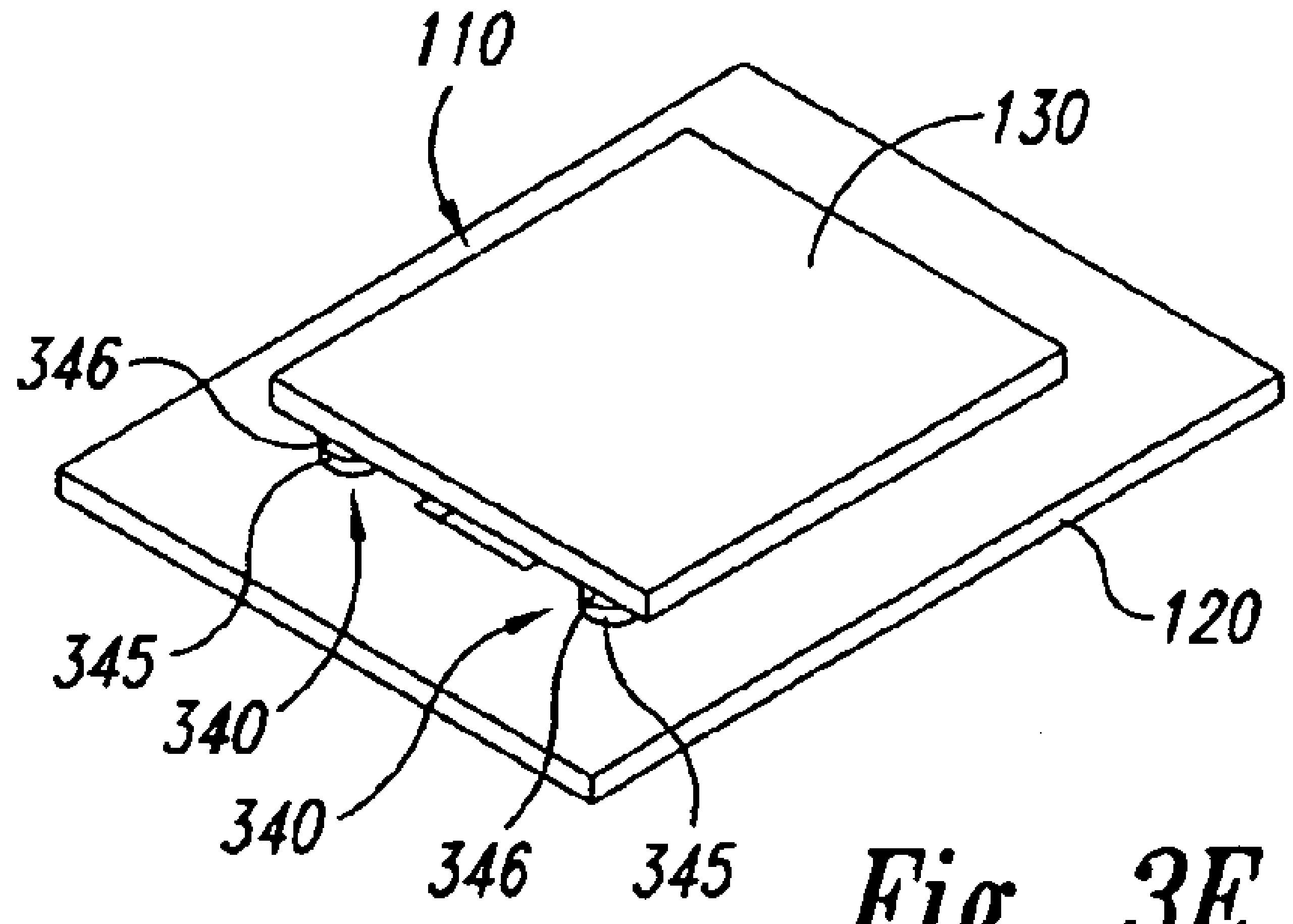

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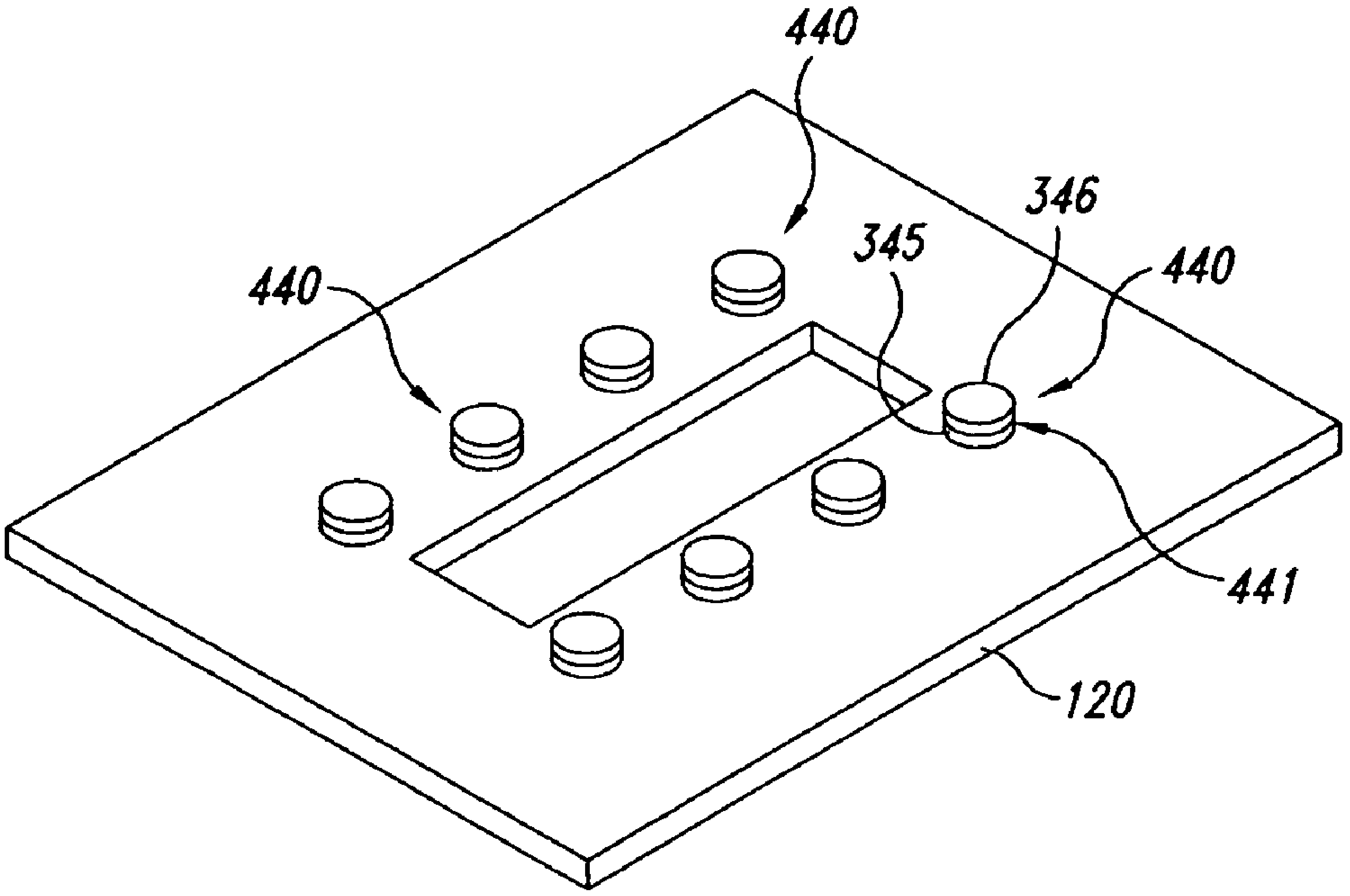

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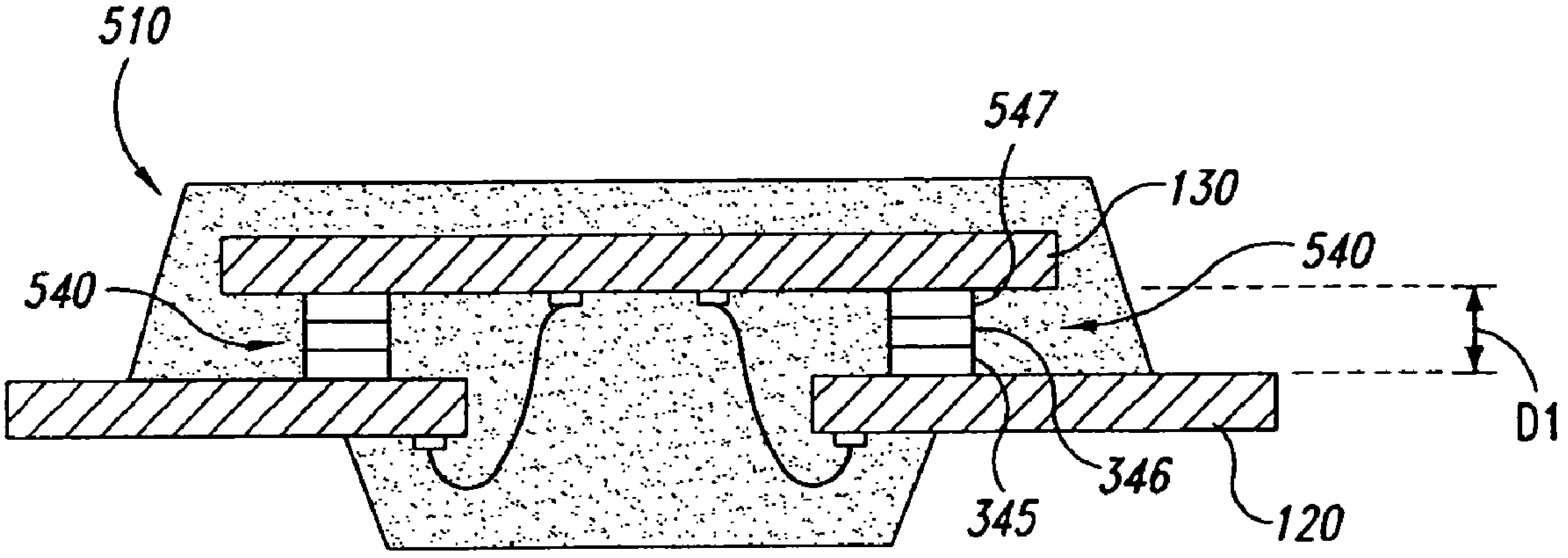

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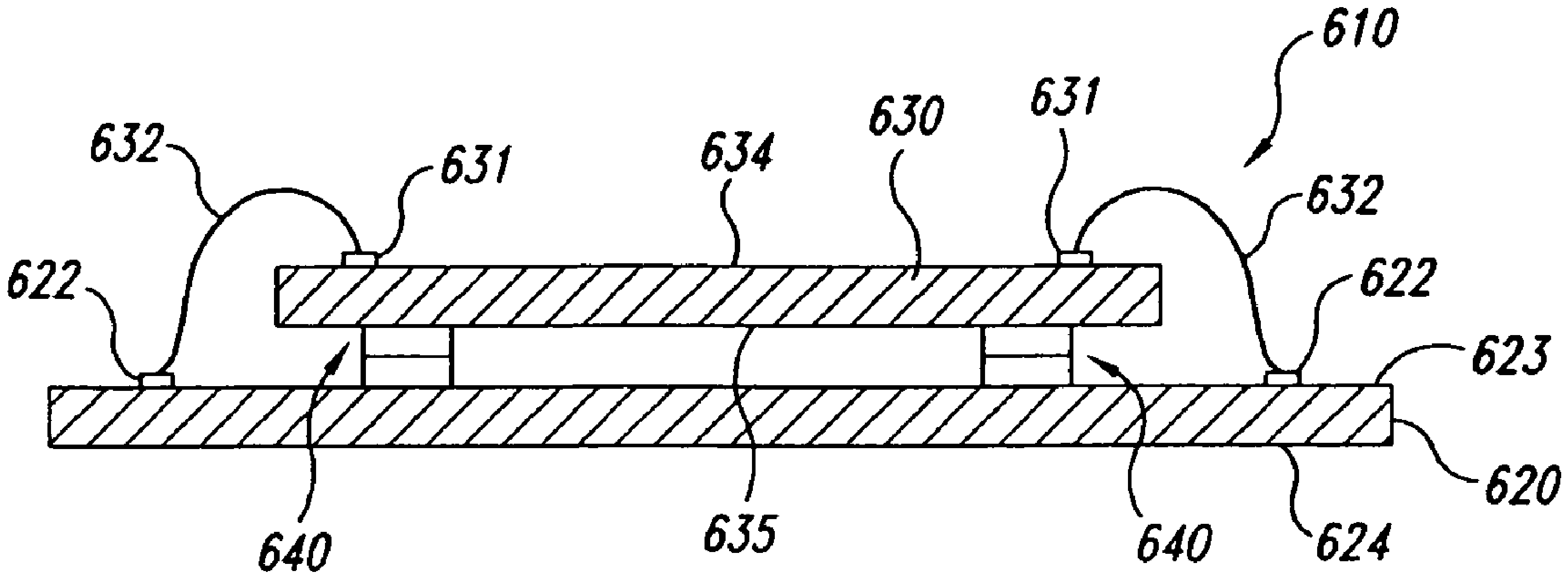
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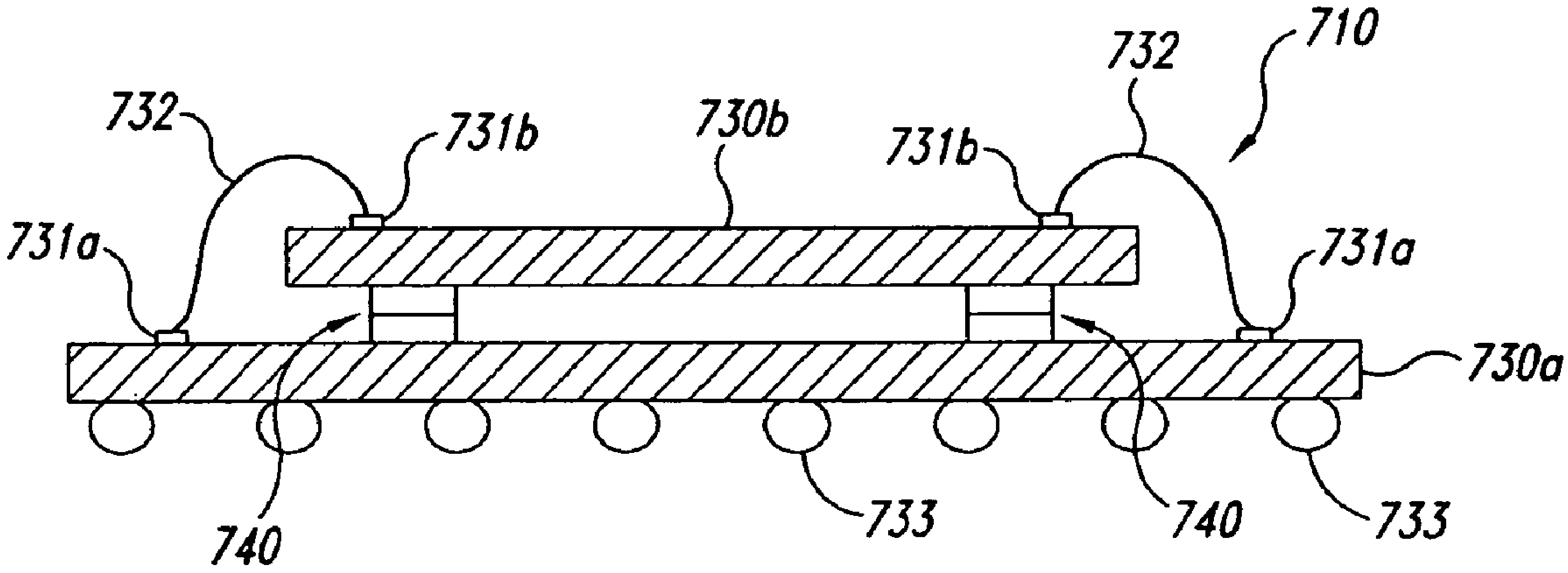
Fig. 6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733

Fig. 7

METHOD AND APPARATUS FOR ATTACHING MICROELECTRONIC SUBSTRATES AND SUPPORT MEMBERS

CROSS-REFERENCE TO RELATED APPLICATION

This application is a divisional of U.S. patent application Ser. No. 10/116,645, filed Apr. 4, 2002, which is incorporated herein by reference in its entirety.

BACKGROUND

Conventional microelectronic device packages typically include a microelectronic substrate or die attached to a support member, such as a printed circuit board. Bond pads or other terminals on the die are electrically connected to corresponding terminals of the support member, for example, with wire bonds. The die, the support member, and the wire bonds are then encapsulated with a protective epoxy material to form a device package. The package can then be electrically connected to other microelectronic devices or circuits, for example, in a consumer or industrial electronic product such as a computer.

In one existing arrangement shown in FIG. 1A, a microelectronic device package **10***a* includes a support member **20** having an aperture **21**. A microelectronic substrate **30** is attached to the support member **20** with strips of adhesive tape **40***a*. Substrate bond pads **31** are then electrically connected to corresponding support member bond pads **22** with wire bonds **32** that extend through the aperture **21**. An encapsulant **11**, which includes a suspension of filler material particles **12**, is disposed over the microelectronic substrate **30** and the wire bonds **32**. The sizes of the filler material particles **12** in any given package **10***a* typically range in a standard distribution about a selected mean value.

One drawback with the foregoing arrangement is that the filler material particles **12** (and in particular, the largest filler material particles **12**) can impinge on and damage the microelectronic substrate **30**. Because the larger particles **12** tend to settle toward the support members **20**, one approach to addressing the foregoing drawback is to increase the separation distance between the microelectronic substrate **30** and the support member **20** by increasing the thickness of the tape **40***a*. Accordingly, an advantage of the tape **40***a* is that it can be selected to have a thickness sufficient to provide the desired separation between the microelectronic substrate **30** and the support member **20**. However, a drawback with the tape **40***a* is that it can be expensive to install. A further drawback is that the tape **40***a* can be difficult to accurately position between the support member **20** and the microelectronic substrate **30**.

FIG. **1**B illustrates another existing microelectronic device package **10***b* having a microelectronic substrate **30** attached to the support member **20** with screen printed strips of epoxy **40***b*. The epoxy **40***b* can be easier than the tape **40***a* (FIG. **1**A) to dispense on the support member **20**, but can have other problems. For example, the epoxy **40***b* can apply stresses to the sides of the microelectronic substrate **30**, but it may be difficult to control how much of the sides the epoxy **40***b* contacts, making it difficult to control the stress applied to the microelectronic substrate **30**. Another drawback is that the thickness of the epoxy **40***b* typically ranges from about 8 microns to about 25 microns, while in some cases the desired separation between microelectronic substrate **30** and the support member **20** is greater than about 75 microns, for example, to avoid the particle impingement problem described above. Still another drawback is that the interfaces between the epoxy **40***b* and the encapsulant **11** (one located to the outside of the microelectronic substrate **30** and the other located beneath the microelectronic substrate **30**) can delaminate, which can reduce the integrity of the package **10***b*. The interface located beneath the microelectronic substrate **30** can also create a high stress region that can cause a crack C to form in the encapsulant **11**. The crack C can damage the integrity of the wire bond **32**.

Another problem with both the tape **40***a* and the epoxy **40***b* is that the coefficient of thermal expansion (CTE) of these components is typically substantially different than the CTE of other components of the package. For example, the microelectronic substrate **30** typically has a CTE of about 3 parts per million (ppm) per ° C., the support member **20** typically has a coefficient CTE of about 50 ppm/° C., and the encapsulant **11** typically has a CTE of from about 10-15 ppm/° C. By contrast, the tape **40***a* and the epoxy **40***b* each have a CTE of about 150-400 ppm/° C. Accordingly, both the tape **40***a* and the epoxy **40***b* can exert substantial shear and/or normal forces on the microelectronic substrate **30** during thermal excursions for curing, reflow and other processes. These forces can crack the microelectronic substrate **30**, and/or delaminate layers from the microelectronic substrate **30** and/or the support member **20**, causing the package to fail.

SUMMARY

The present invention is directed toward microelectronic packages and methods for forming such packages. A method in accordance with one aspect of the invention includes providing a support member having a first surface, a second surface facing opposite the first surface, and a projection extending away from the first surface. The method can further include forming an attachment structure by applying a quantity of adhesive material to the projection and connecting the adhesive material to the microelectronic substrate with a surface of the microelectronic substrate facing toward the first surface of the support member and with the attachment structure providing no electrically conductive link between the microelectronic substrate and the support member. The microelectronic substrate and the support member can then be electrically connected, for example, with a wire bond.

In one aspect of the invention, the projection can include an electrically conductive material, such as copper or aluminum. Alternatively, the projection can have the same composition as the adhesive material. In another aspect of the invention, the attachment structure can be formed by disposing a first quantity of material on at least one of the microelectronic substrate and the support member while the first quantity of material is at least partially flowable. The flowability of the first quantity of material can be at least partially reduced, and a second quantity of material can be applied to the attachment structure while the second quantity of material is at least partially flowable. The attachment structure can then be connected to the other of the microelectronic substrate and the support member.

In other aspects of the invention, the attachment structure can have a first bond strength at a joint with the support member, and a second bond strength at a joint with the microelectronic substrate, with the second bond strength greater than the first bond strength. The height of the attachment structure can be about 35 microns or more in one embodiment, and can exceed 75 microns in another embodiment. In

still further aspects of the invention, the attachment structure can be connected between two microelectronic substrates.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1**A is a cross-sectional view of a microelectronic device package having a tape adhesive in accordance with the prior art.

FIG. **1**B is a cross-sectional view of a microelectronic device package having an epoxy adhesive in accordance with the prior art.

FIGS. **2**A-**2**E illustrate a process for attaching a microelectronic substrate to a support member in accordance with an embodiment of the invention.

FIGS. **3**A-**3**E illustrate an in-line process for attaching a microelectronic substrate to a support member in accordance with another embodiment of the invention.

FIG. **4** is a partially schematic isometric view of a support member having attachment structures in accordance with another embodiment of the invention.

FIG. **5** is a cross-sectional view of a microelectronic package having attachment structures in accordance with still another embodiment of the invention.

FIG. **6** is a cross-sectional view of a microelectronic substrate mounted to a support member to form a package in accordance with another embodiment of the invention.

FIG. **7** is a cross-sectional view of two microelectronic substrates attached to each other with attachment structures in accordance with another embodiment of the invention.

DETAILED DESCRIPTION

The present disclosure describes microelectronic substrate packages and methods for forming such packages. The term "microelectronic substrate" is used throughout to include substrates upon which and/or in which microelectronic circuits or components, data storage elements or layers, and/or vias or conductive lines are or can be fabricated. Many specific details of certain embodiments of the invention are set forth in the following description and in FIGS. **2**A-**7** to provide a thorough understanding of these embodiments. One skilled in the art, however, will understand that the present invention may have additional embodiments, and that the invention may be practiced without several of the details described below.

FIGS. **2**A-**2**E illustrate a process for attaching a microelectronic substrate to a support member to form a microelectronic package in accordance with an embodiment of the invention. Referring first to FIG. **2**A, the process can include providing a support member **120** (such as a printed circuit board) having a generally flat, planar shape with a first surface **123** and a second surface **124** facing opposite from the first surface **123**. An aperture **121** can extend through the support member **120** from the first surface **123** to the second surface **124** to receive conductive couplers, as described in greater detail below with reference to FIG. **2**E.

Referring now to FIG. **2**B, one or more attachment structures **140** (two are shown in FIG. **2**B) can be disposed on the support member **120**. Each attachment structure **140** can include a projection **141** that extends away from the first surface **123**. The projections **141** can be formed from any of a variety of materials in accordance with any of a variety of methods. For example, the projections **141** can include a conductive material, such as copper or aluminum, disposed on the support member **120** in a process such as a chemical vapor deposition, physical vapor deposition, or electrochemical deposition process. The projections **141** can then be shaped using conventional etching techniques. Alternatively, the projections **141** can include nonconductive materials, such as a solder mask material, an epoxy material, or an adhesive strip (e.g., a tape material). In one embodiment, the projections **141** can include a flowable die attach material, as described in greater detail below with reference to FIGS. **3**A-**3**E. In another embodiment, the projections **141** can be formed integrally with the support member **120**, for example during the initial manufacture of the support member **120**. In any of these embodiments, the projections **141** can be positioned to support a microelectronic substrate relative to the support member **120**.

FIG. **2**C is a cross-sectional view of the support member **120** shown in FIG. **2**B, with adhesive material portions **142** disposed on each of the projections **141**. The adhesive materials portions **142** can include a conventional die attach material, such as QMI 536, available from Dexter Electronic Materials, a business of Loktite Corporation of Rocky Hills, Conn., or 2025D, available from Ablestik of Rancho Dominguez, Calif. In other embodiments, the adhesive material portions **142** can include other materials. For example, the adhesive material portions **142** can include adhesive tape strips, such as double-backed tape strips. In any of these embodiments, the adhesive material portions **142** can be selected to adhere to both the projection **141** and a microelectronic substrate, as described in greater detail below with reference to FIG. **2**D.

Referring now to FIG. **2**D, a microelectronic substrate **130** can be connected to and/or carried by the attachment structures **140** by contacting the microelectronic substrate **130** with the adhesive material portions **142** to form a microelectronic package **110**. Accordingly, the attachment structures **140** can include a first joint **143** at the interface with the support member **120**, and a second joint **144** at the interface with the microelectronic substrate **130**. In some embodiments, the first joint **143** and the second joint **144** can be selected to have different strengths. For example, if the support member **120**, the microelectronic substrate **130**, and/or or the attachment structure **140** have unequal coefficients of thermal expansion (CTEs), and this mismatch is large enough to cause the connection between the support member **120** and the microelectronic substrate **130** to fail, it may be desirable to have the failure occur at the first joint **143** (where the attachment structure **140** joins the support member **120**) rather than at the second joint **144** (where the attachment structure **140** joins the microelectronic substrate **130**). In particular, if the attachment structure **140** can cause damage to the component from which it separates, it may be desirable to confine such damage to the support member **120** rather than allow the microelectronic substrate **130** to be damaged. In one embodiment for which the strength of the first joint **143** is lower than the strength of the second joint **144**, the projections **141** can include the QMI 536 material referred to above, and the adhesive material portions **142** can include 2025D die attach adhesive. In other embodiments, other materials can be selected for the projections **141** and the adhesive material portions **142**. In any of these embodiments, the adhesive material portions **142** can include a material that is at least initially flowable and is disposed in its flowable state on the projection **141**.

In one aspect of an embodiment shown in FIG. **2**D, portions of the attachment structures **140** can include electrically conductive materials, but the attachment structures **140** do not provide a conductive link between the support member **120** and the microelectronic substrate **130**. For example, the projections **141** can include an electrically conductive material while the adhesive material **142** includes an insulative material. In other embodiments, other portions of the attachment structures **140** (such as the projections **141**) can be insulative so that the attachment structures **140** do not provide a conductive link between the support member **120** and the microelectronic substrate **130**. Instead, electrical communication between these components can be provided by separate conductive couplers, as described below with reference to FIG. 2E.

As shown in FIG. 2E, the microelectronic substrate **130** can be electrically connected to the support member **120** with conductive couplers **132**, such as wire bonds. For example, the conductive couplers **132** can extend between substrate bond pads **131** positioned on the lower surface of the microelectronic substrate **130**, and support member bond pads **122** positioned on the second surface **124** of the support member **120**. Accordingly, the conductive couplers **132** can extend through the aperture **121** of the support member **120**. An encapsulant **111** can then be disposed over the microelectronic substrate **130** and at least a portion of the support member **120** to protect the physical and electrical connections between the microelectronic substrate **130** and the support member **120**. Alternatively, the encapsulant **111** can be eliminated. For example, the microelectronic substrate **130** and the associated electrical connections can be protected with a hollow cap disposed over the support member **120**.

In another aspect of an embodiment shown in FIG. **2**E, a distance D**1** between the microelectronic substrate **130** and the support member **120** (i.e., the height of the attachment structure **140**) can be selected to enhance the performance of the package **110**. For example, in one embodiment, the distance D**1** can be selected to be greater than 25 microns (the distance conventionally achievable with an epoxy bond) and, in a further aspect of this embodiment, the distance D**1** can be selected to be 35 microns or greater. In still a further aspect of this embodiment, the distance D**1** can be selected to be about 75 microns, or 100 microns, or greater to reduce the likelihood for filler material disposed in the encapsulant **111** to impinge on and damage the microelectronic substrate **130**.

In another aspect of an embodiment shown in FIG. **2**E, a distance D**2** (by which the projection **141** extends above the support member **120**), and a distance D**3** (by which the adhesive material volume **142** extends above the projection **141**) can be selected in a variety of manners to achieve the overall separation distance D**1** described above. For example, D**2** can be relatively large and D**3** relatively small to reduce the volume occupied by the adhesive material **142**. In other embodiments, the relative values of D**2** and D**3** can be reversed. In one embodiment in which the projection **141** is formed from an initially flowable material such as epoxy, the distance D**2** can have a value of from about 8 microns to about 25 microns.

In yet another aspect of an embodiment described above with reference to FIG. **2**E, the lateral extent of the attachment structures **140** can be selected to enhance the performance of the package **110**. For example, the attachment structures **140** can be positioned only beneath the microelectronic substrate **130**, rather than extending around the sides of the microelectronic substrate **130** as typically occurs with some conventional epoxy bonds. An advantage of this arrangement, when compared to some conventional epoxy bonds is that attachment structures **140** can be less likely to impose damaging stresses on the microelectronic substrate **130**.

In a further aspect of this embodiment, a lateral extent W**1** of the attachment structure **140** can be significantly less than a lateral extent W**2** of the region of the microelectronic substrate **130** that overlaps the support member **120**. For example, in one embodiment, W**1** can have a value of from about ⅓ to about ½ of the value of W**2**. A feature of this arrangement is that the volume of the attachment structure **140** can be reduced relative to the overall volume of the encapsulant **111**. An advantage of this arrangement is that it can reduce or eliminate damage caused by CTE mismatch. For example, the encapsulant **111** may have a CTE that is more closely matched to that of the microelectronic substrate **130** and/or the support member **120**, while the attachment structure **140** may have a CTE quite different from that of the microelectronic substrate **130** and/or the support member **120**. Accordingly, by controlling the lateral extent W**1** of the attachment structures **140**, the fraction of the volume between the support member **120** and the microelectronic substrate **130** occupied by the attachment structure **140** can be reduced compared with some conventional arrangements. As a result, the attachment structure **140** can be less likely to fail or cause the microelectronic substrate **130** to fail when the package **110** undergoes thermal excursions. Another feature of this arrangement is that the attachment structure **140** can be recessed outwardly from the edge of the aperture **121**. An advantage of this feature is that the potential high stress at the interface between the attachment structure **140** and the encapsulant **111** can be shifted outwardly and can be less likely than existing arrangements (such as that described above with reference to FIG. **1**B) to crack the encapsulant **111**.

FIGS. **3**A-**3**E schematically illustrate a process for forming a microelectronic package **110** generally similar to that described above with reference to FIGS. **2**A-**2**E. In one aspect of this embodiment, the process can be performed by in-line die attach tools, such as are available from Datacon of Radfeld/Tyrole, Austria, or ESEC of Cham, Switzerland. In other embodiments, the process can be performed by other tools

Referring first to FIG. **3**A, the process can include providing a support member **120** having an aperture **121**. As shown in FIG. **3**B, the support member **120** can be positioned beneath a dispense nozzle **350**. The dispense nozzle **350** can dispose two quantities of a first material **345** onto the support member **120**, while the first material **345** is in a flowable state, to form two projections **341** extending away from the first surface **123** of the support member **120**. The projections **341** can define, at least in part, corresponding attachment structures **340**. In one embodiment, the dispense nozzle **350** can dispense a conventional die-attach material, such as QMI 536 or 2025D, described above. In other embodiments, the dispense nozzle **350** can dispose other initially flowable materials. In any of these embodiments, the amount of the first material **345** dispensed on the support member **120** and the distance D**2** by which the resulting projections **341** extend beyond the first surface **123** can be low enough that the projections **341** maintain their shape without collapsing or slumping. For example, the projections **341** can have a height of from about 8 microns to about 25 microns in one embodiment.

As shown in FIG. **3**C, the flowability of the first material **345** can be reduced or eliminated after it has been dispensed on the support member **120**, for example, by applying heat to the first material **345**. In one aspect of this embodiment, the first material **345** can be a thermoset material and can be partially cured (e.g., to B-stage) or fully cured. In a specific aspect of this embodiment, the first material **345** can be "snap cured", for example by exposure to elevated temperatures from about 150° C. to about 200° C. for a period of three seconds or less. In other embodiments, the first material **345** can be exposed to other temperatures and/or can be exposed for other time periods, for example, time periods of up to about ten seconds. In still further embodiments, the flowability of the first material **345** can be reduced by other methods, for example, by cooling. In any of these embodiments, by at least reducing the flowability of the first material **345**, the material **345** will tend to retain its shape and height and can more stably and securely support a second material, as described in greater detail below with reference to FIG. **3**D.

Referring now to FIG. **3**D, a second material **346** can be disposed on each of the projections **341** while the second material **346** is in a flowable state to increase the height of the corresponding attachment structures **340**. In one embodiment, the second material **346** can have a composition identical to that of the first material **345**. Alternatively, the second material **346** can have a different composition than that of the first material **345**. In either embodiment, the second material **346** can be dispensed on the projections **341** by the same dispense nozzle **350** that dispensed the first material **345**, or by a different dispense nozzle. In any of these embodiments, the second material **346** can have adhesive properties, so as to adhere to the first material **345** and to the microelectronic substrate **130**, as described below with reference to FIG. **3**E.

Referring now to FIG. **3**E, the microelectronic substrate **130** can be attached to the second material **346** of the attachment structures **340**. The resulting package **110** can then be encapsulated after the microelectronic substrate **130** is electrically coupled to the support member **120**. Accordingly, the foregoing process can include sequentially disposing first and second flowable materials to build up attachment structures having heights, widths, and bond strengths generally similar to those described above with reference to FIGS. **2**A-**2**E. The in-line arrangement of this process can result in an efficient and effective package formation procedure.

In other embodiments, the attachment structures and packages described above with reference to FIGS. **2**A-**3**E can have other arrangements. For example, referring to FIG. **4**, the support member **120** can include a plurality of attachment structures **440** that are arranged in discrete columns rather than continuous strips. Each attachment structure **440** can include a projection **441** formed, for example, from the first material **345**. Alternatively, the projections **441** can include non-flowable materials. Each attachment structure **440** can further include a second material **346** disposed on the projection **441**. The second material **346** can be applied in a manner generally similar to any of those described above with reference to FIGS. **2**A-**3**E. In one aspect of this embodiment, the attachment structures **440** can have a generally circular cross-sectional shape and in other embodiments, the attachment structure **440** can have other shapes. In one embodiment, the attachment structures **440** can be arranged in rows, and in other embodiments the attachment structures **440** can be arranged in other patterns or arrays. In any of these embodiments, the attachment structures **440** can be connected to a corresponding microelectronic substrate **130** (not shown in FIG. **4**) in a manner generally similar to that described above.

FIG. **5** is a cross-sectional view of a package **510** having the microelectronic substrate **130** connected to the support member **120** with attachment structures **540** in accordance with another embodiment of the invention. In one aspect of this embodiment, each attachment structure **540** can include the first material **345**, the second material **346** and a third material **547**. In one aspect of this embodiment, the flowability of the first material **345** can be reduced before applying the second material **346**, and the flowability of the second material **346** can be reduced before applying the third material **547**. Alternatively, the first material **345** can be replaced with a conductive or a nonconductive material disposed by processes generally similar to those described above with reference to FIG. **2**B. In still further embodiments, the attachment structures **540** can include more than three sequentially disposed quantities of material to achieve the desired separation distance D**1** and/or other characteristics.

FIG. **6** illustrates a package **610** having a microelectronic substrate **630** supported on a support member **620** in accordance with another embodiment of the invention. In one aspect of this embodiment, the microelectronic substrate **630** can be attached to the support member **620** with attachment structures **640** having characteristics generally similar to any of those described above with reference to FIGS. **2**A-**5**. In a further aspect of this embodiment, the package **610** can have a “chip on board” configuration. Accordingly, the support member **620** can have a first surface **623** and a second surface **624** facing opposite from the first surface **623**. The microelectronic substrate **630** can have a first surface **634** and a second surface **635** facing opposite the first surface **634** and facing toward the first surface **623** of the support member **620**. The first surface **634** of the microelectronic substrate **630** can include substrate bond pads **631** which are connected with conductive couplers **632** (such as wire bonds) to corresponding support member bond pads **622** positioned on the first surface **623** of the support member **620**. The physical and electrical connections between the microelectronic substrate **630** and the support member **620** can be protected, for example, with an encapsulant, a shell, or a cap.

FIG. **7** illustrates a microelectronic package **710** having a plurality of microelectronic substrates connected to each other in accordance with another embodiment of the invention. In one aspect of this embodiment, the package **710** can include a first microelectronic substrate **730***a* having first bond pads **731***a*. A second microelectronic substrate **730***b* can be attached to the first microelectronic substrate **730***a* with attachment structures **740** having configurations generally similar to any of those described above with reference to FIGS. **2**A-**5**. The second microelectronic substrate **730***b* can include second bond pads **731***b* connected to the first bond pads **731***a* of the first microelectronic substrate **730***a* with conductive couplers **732**, such as wire bonds. Solder balls **733** or other conductive devices can provide for electrical communication to and from the package **710**.

From the foregoing, it will be appreciated that specific embodiments of the invention have been described herein for purposes of illustration, but that various modifications may be made without deviating from the spirit and scope of the invention. Accordingly, the invention is not limited except as by the appended claims.

I claim:

1. A microelectronic package, comprising:

a first microelectronic substrate having a first active surface and a first back surface opposite the first active surface, the first microelectronic substrate carrying a first bond site at the first active surface;

a second microelectronic substrate positioned at least proximate to the first microelectronic substrate, the second microelectronic substrate having a second active surface and a second back surface opposite the second active surface and facing the first active surface of the first microelectronic substrate, the second microelectronic substrate carrying a second bond site at the second active surface;

a plurality of attachment structures connected directly between the first active surface of the first microelectronic substrate and the second back surface of the second microelectronic substrate, the attachment structures individually having a first quantity of material disposed on the first active surface of the first microelectronic substrate and a second quantity of material in direct contact with the first quantity of material and the second back surface of the second microelectronic substrate, the attachment structures forming no electrically conductive link between the first and second microelectronic substrates and being offset inwardly from a proximate edge of the second microelectronic substrate, wherein the attachment structures are laterally spaced apart from one another; and

a wirebond connected directly between the first and second bond sites of the first and second microelectronic substrates.

2. The package of claim **1** wherein the first quantity of material is at least partially cured before the second quantity of material is disposed on the first quantity of material.

3. The package of claim **1** wherein the first quantity of material has a thickness of from about 8 microns to about 25 microns.

4. The package of claim **1** wherein the attachment structure is one of a plurality of attachment structures.

5. The package of claim **1** wherein at least one of the first and second quantities of material includes an epoxy.

6. The package of claim **1** wherein at least one of the first and second quantities of material includes an electrically conductive material.

7. The package of claim **1** wherein at least one of the first and second quantities of material includes a solder mask material.

8. The package of claim **1** wherein the first quantity of material has a first composition and the second quantity of material has a second composition different than the first composition.

9. The package of claim **1** wherein the first quantity of material has a first composition and the second quantity of material has a second composition at least generally similar to the first composition.

10. The package of claim **1** wherein the first quantity of material and the second quantity of material have at least approximately the same composition and form a generally homogeneous attachment structure between the first and second microelectronic substrates.

11. The package of claim **1** wherein the first quantity of material includes a projection extending from the first microelectronic substrate, and wherein the second quantity of material includes an adhesive disposed on the projection.

12. The package of claim **1** wherein the first quantity of material includes an epoxy.

13. The package of claim **1** wherein the second quantity of material includes an epoxy.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,615,871 B2 Page 1 of 1
APPLICATION NO. : 11/480755
DATED : November 10, 2009
INVENTOR(S) : Tongbi Jiang

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In column 1, line 9, after "2002," insert -- now U.S. Pat. No. 7,109,588 --.

Signed and Sealed this

Nineteenth Day of January, 2010

David J. Kappos

David J. Kappos
Director of the United States Patent and Trademark Office